PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Brian Lutz	**EXAMINER:**	Ching Chang
SERIAL NO.:	10/016,563	**GROUP ART UNIT:**	3748
FILED:	October 30, 2001	**ATTY DKT NO.:**	D5235

TITLE: VALVE ACTUATION LINKAGE MECHANISM

CERTIFICATE OF FIRST CLASS MAILING UNDER 37 C.F.R. §1.8(a)

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January 22, 2004
Date

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Commissioner for Patents
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APPEAL BRIEF UNDER C.F.R. §1.192

Sir:

I. REAL PARTY IN INTEREST

International Engine Intellectual Property Company, L.L.C. is the assignee of the present invention.

II. RELATED APPEALS AND INTERFERENCES

None known.

III. STATUS OF CLAIMS

This application was filed with 19 claims, and 0 additional claims were added by amendment. Claims 1-9 and 11-19 are pending, claim 10 was cancelled, and claims 1-3, 5-7, 14, 15, and 17-19 stand twice rejected. Claims 4 and 16 are objected to as being dependent upon a rejected base claim. Claims 8, 9, and 11-13 are allowed. The rejection of claims 1-3, 5-7, 14, 15, and 17-19 is appealed.

IV. STATUS OF AMENDMENTS

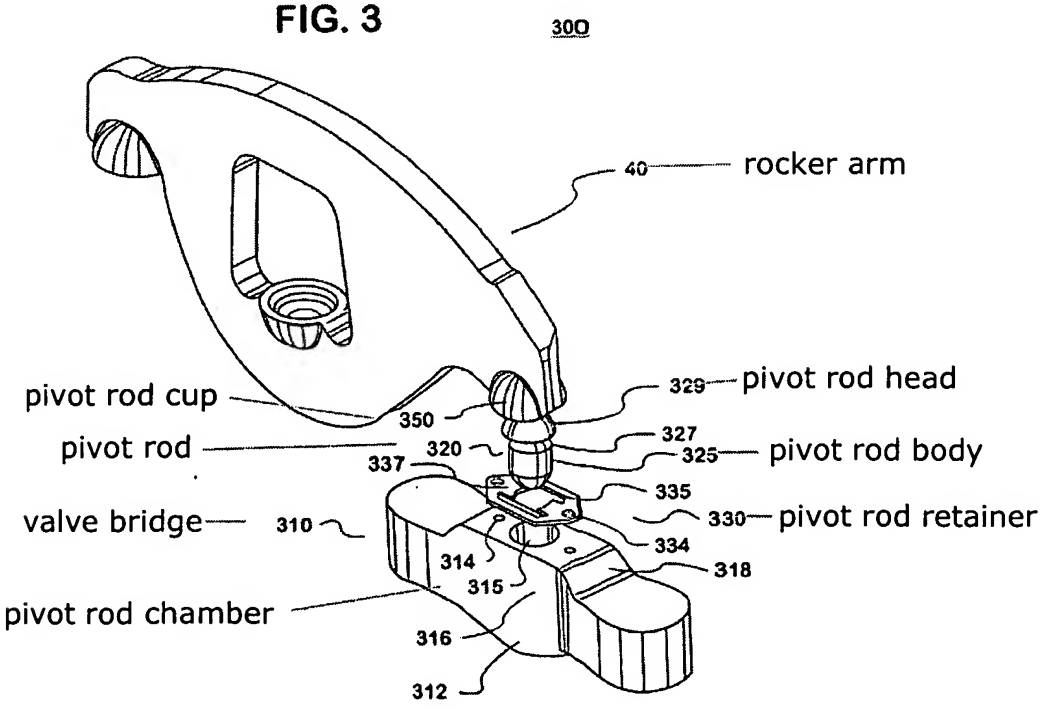
No amendment to the claims was filed subsequent to the final rejection.

V. SUMMARY OF INVENTION

Internal combustion engines typically have rocker arms to actuate intake and exhaust valves, which permit air to enter and exit each cylinder. Push rods cause the rocker arms to rotate or pivot and thereby actuate the valves. The push rods extend through the engine to connect to a camshaft. As the camshaft rotates, the push rods move the rocker arms to open and close the valves. [Paragraph 2, page 1, lines 7-13]

Figure 3 illustrates a perspective view of a valve actuation linkage mechanism 300 that comprises a valve bridge 310, a pivot rod 320, a pivot rod retainer 330 and a rocker arm 40. [Paragraph 20, page 5, lines 14-19]

FIG. 3



The rocker arm 40 cooperates with the pivot rod 320 in the valve actuation linkage mechanism 300 to actuate the valve bridge 310. The pivot foot as shown comprises a pivot rod head 329, a pivot rod neck 327, and a pivot rod body 325. The pivot rod head 329 is shown with a curved shape in the form of a "mushroom" head. The pivot

rod head 329 cooperates with a pivot rod cup 350 in the rocker arm 40. The complimentary shapes of the curved pivot rod head 329 and the pivot rod cup 350 allow for easier cooperation between the two parts and tend to reduce wear as the valve actuation linkage mechanism 300 operates. [Paragraph 21, page 5, line 20 through page 6, line 7]

A valve bridge 310 acts simultaneously on, for example, a pair of intake or exhaust valves (not shown). The valve bridge 310 as shown comprises a pivot rod chamber 315, a pair of fastener bores 314, valve stem chambers 405 (shown in Figure 4), a bottom valve bridge section 312 and a middle valve bridge section 316. The pivot rod chamber 315 is shown as a hollow cylindrical void or chamber in which the pivot rod body 325 is at least partially inserted 320. [Paragraph 22, page 6, lines 8-22 and page 7, lines 1-2]

The pivot rod chamber 315 is shown located in the middle valve bridge section 316 and may be cast as part of or drilled into the valve bridge 310. The fastener bores 314 are typically bored into the valve bridge 310 adjacent to the pivot rod chamber 315. The fastener bores 314 allow the pivot rod 310 to be secured in the pivot rod chamber 315 via the pivot rod retainer 330. [Paragraph 23, page 7, lines 3-14]

The pivot rod retainer 330 is shown as flat and comprises a pivot rod retaining area 335, a pair of pivot rod retaining prongs 337, and a pair of opposing fastener orifices 334. The pivot rod retaining area 335 is configured in a manner so that the pivot rod 320, once inserted, moves as necessary as the rocker arm 40 goes through its motion during engine operation. [Paragraph 24, page 7, lines 15-23 and page 8, lines 1-2]

The pivot rod 320 may be inserted into the pivot rod retainer 330 before the retainer 330 is fastened to the valve bridge 310 [Paragraph 25, page 8, lines 3-13] or after the retainer 330 is fastened to the valve bridge 310 [Paragraph 26, page 8, lines 14-21].

Once the pivot rod 320 is secured to the valve bridge 310, the rocker arm 40 interacts or cooperates with the pivot rod 320/valve bridge 310 combination in the valve actuation linkage mechanism 300 to actuate corresponding valves. The pivot rod 320 rotates freely and moves about the pivot rod head 329 and pivot rod bottom 425 (shown in Figure 4) as necessary to account for the rotation and translation, for example, as required for a 4-valve per cylinder engine utilizing a valve bridge 310.

Enough play or space is provided in the pivot rod retaining area 335 such that the pivot rod body 325 moves back and forth or vertically to translate the motion of the rocker arm 40 to the valve bridge 310 to appropriately actuate the valves during engine operation. [Paragraph 27, page 8, lines 22-23 and page 9, lines 1-9]

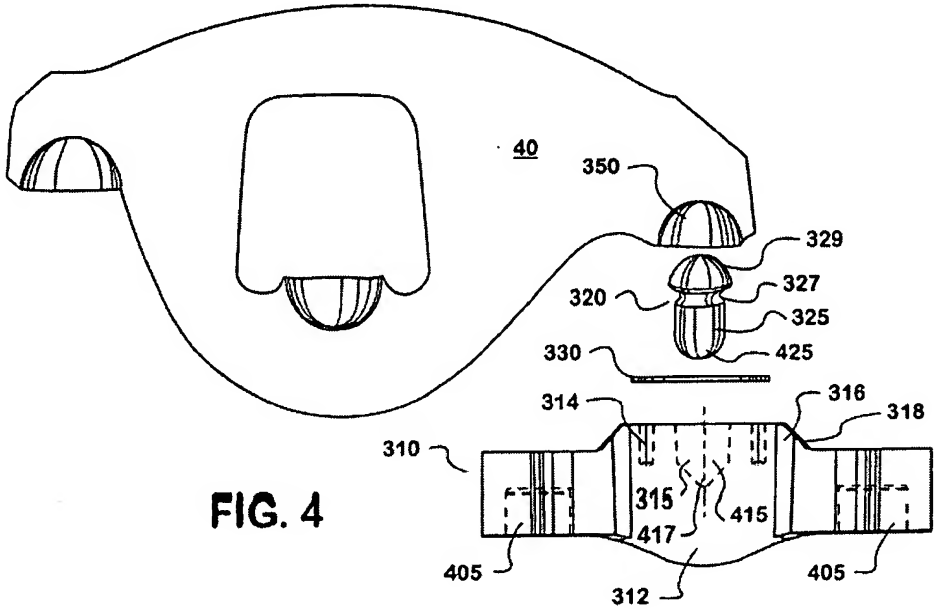


FIG. 4

Figure 4 shows a side view of the valve bridge 310 comprising a pivot rod chamber 315, a pair of fastener bores 314, valve stem chambers 405, a bottom valve bridge section 312 and a middle valve bridge section 316. A divot or dimple 417 at the pivot chamber bottom 415 holds engine oil or some other lubricant to provide lubrication between the pivot rod 320 and the valve bridge 310. [Paragraph 29, page 9, lines 15-23 and page 10, lines 1-3]

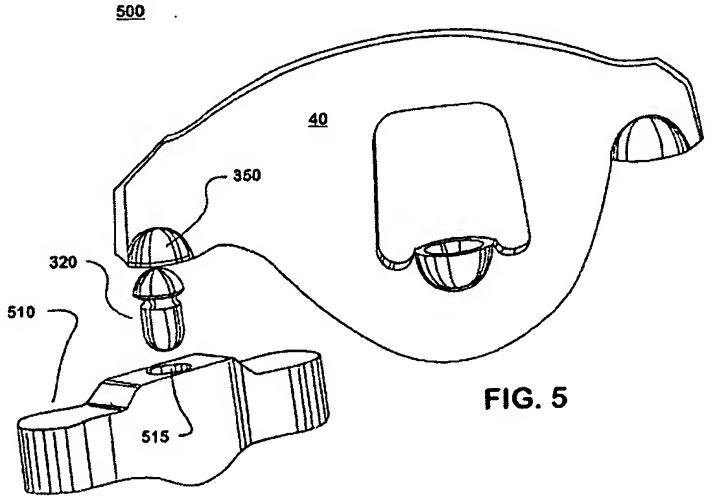


FIG. 5

Figure 5 illustrates a perspective view of an embodiment of a valve actuation linkage mechanism 500 that does not use the pivot rod retainer 330. The valve actuation linkage mechanism 500 may be held in position by close tolerances between the rocker arm 40, the pivot rod 320, and the valve bridge 310 once the valve actuation linkage mechanism 500 is operationally installed in an engine. [Paragraph 31, page 10, lines 14-21]

The valve actuation linkage mechanism 500 operates in a manner substantially similar to that described in the embodiment of Figure 3. Once the pivot rod 320 is installed in the valve bridge 310, the rocker arm 40 cooperates with the pivot rod 320/valve bridge 310 combination to actuate corresponding valves. [Paragraph 32, page 10, lines 1-2 and page 11, lines 1-8]

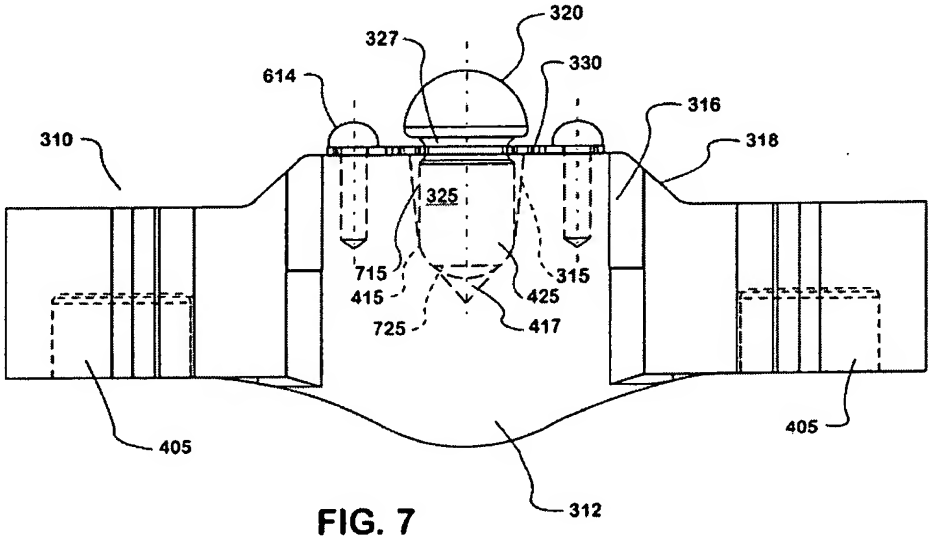
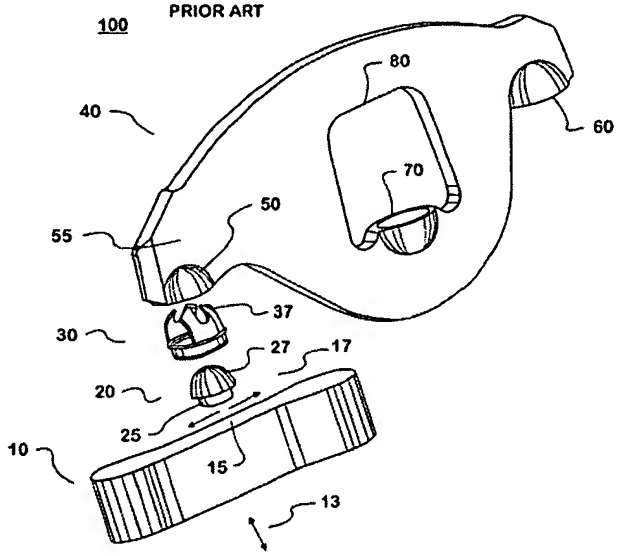


FIG. 7

Figure 7 shows a pivot rod chamber movement area 715 that allows the pivot rod to move back and forth inside the pivot rod chamber 315 to compensate for the arc motion of the rocker arm 40 during engine operation. In this manner the vertical motion of the rocker arm 40 can be translated to the valve bridge 310 during engine operation. The configuration of the pivot rod bottom 425 and the corresponding pivot rod chamber bottom 415 eliminate the flat surface rubbing contact 15 present in prior designs such as shown in Figure 1 below. Instead of a flat surface contact area 15, the curved surfaces of the pivot rod bottom 425 and the corresponding pivot rod chamber bottom 415 result in a contact line or contact line area 725 between both

components. The resultant contact line area 725 is smaller than the flat surface rubbing contact 15, and friction wear between the pivot rod 320 and the valve bridge 310 is reduced. [Paragraph 35, page 12, lines 10-14 and page 13, lines 1-3]

FIG. 1
PRIOR ART



VI. ISSUES

Claims 1, 2, 7, 14, and 19 stand rejected under 35 U.S.C. §102(b) in view of Mallas (U.S. Patent No. 4,850,315). Claims 3, 5, 6, 15, 17, and 18 were rejected under 35 U.S.C. §103(a) given Mallas in view of Perez et al. (U.S. Patent No. 6,273,042). The applicant disputes these rejections under 35 U.S.C. §102(b) and 35 U.S.C. §103(a).

VII. GROUPING OF CLAIMS

Although claims 1, 2, 7, 14, and 19 stand rejected as one group and claims 3, 5, 6, 15, 17, and 18 stand rejected as another group, the applicant respectfully requests that the claims be considered in three separate groups. Group I consists of claims 1, 2, and 14, Group II consists of claims 7 and 19, and Group III consists of claims 3, 5, 6, 15, 17, and 18. The applicant respectfully submits that the claims should not stand or fall together, and intends to present reasons, within the appropriate argument sections, why the applicant considers the rejected claims to be separately patentable.

VIII. ARGUMENT

GROUP I CLAIMS

Group I consists of claims 1, 2, and 14, which stand rejected under 35 U.S.C. §102(b) in view of Mallas.

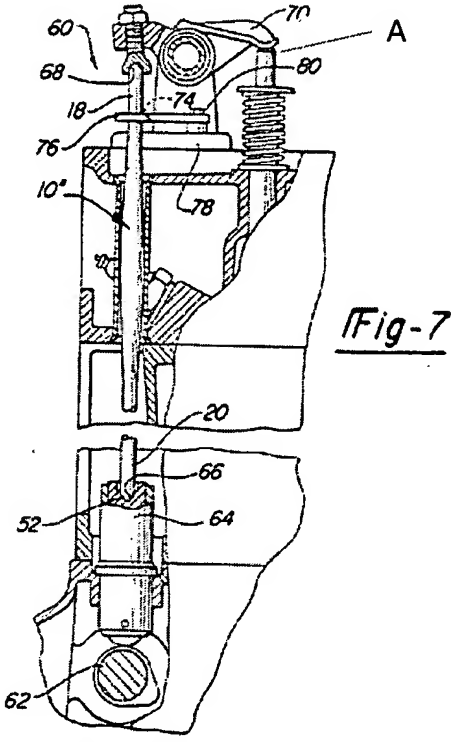


Fig-7

Mallas summarizes his invention as "a single piece push rod is provided in the form of an elongated hollow tube having a middle portion with a larger outer diameter than the tube has near its ends" (Column 1, lines 40-43). Mallas is concerned with making a better push rod.

Mallas' teachings concerning a "valve linkage mechanism" are as follows.

> FIGS. 7 and 8 illustrate the push rod 10" in use in an internal combustion engine 60. The engine 60 includes a plurality of cylinders having intake and exhaust valves mounted on the head. The valves are opened by means of a cam 62 that pushes upward on cam follower 64. The seat 52 on the end portion 20 of push rod 10" fits within a pocket 66 in the cam follower 64. The seat on the opposite end portion 18 engages the socket 68 formed in a rocker 70. The rocker 70 is suitably connected to the intake or exhaust valve.

Mallas shows in Fig-7 and describes that the cam 62 operates on the cam follower, which engages the push rod to cause the rocker 70 to presses on a valve stem, that is marked by the Applicant with reference "A" in the above figure because Mallas did not give this valve stem a reference. Thus, the only valve linkage mechanism that Mallas appears to teach is a rocker arm that directly engages the valve stem. Mallas does not teach, suggest, or show a valve bridge as known in the art or as taught by the present invention.

As described above with respect to the various embodiments of the present invention, when a push rod acts on a rocker arm, the valve linkage mechanism of the present invention utilizes a pivot rod cup 350 disposed in a rocker arm 40 to act on a pivot rod head 329 of a pivot rod 320, thereby causing the pivot rod body 325 to pivot in the pivot rod chamber 315 of a valve bridge 310 that operates on the valves.

In the Office Actions, the Examiner states Mallas' cam follower 64 is a valve bridge. Mallas makes no teachings regarding a valve bridge or any similar device. It is known in the art that a cam follower, also known as a tappet or roller tappet, is not a valve bridge. A valve bridge operates on the valves, not under the push rods. Further, it is not known in the art that a cam operates on a valve bridge, nor does Mallas make such a teaching. Both Mallas, Perez, and the present invention teach that a cam/cam follower operate on push rods. None of these references teach or suggest that a valve bridge is a cam follower.

Thus, a cam follower is not a valve bridge, and the Mallas reference fails to teach a valve bridge, and a valve bridge having a pivot rod chamber, as set forth in independent claims 1 and 14.

In the Office Actions, the Examiner states that Mallas' push rod 10" is a pivot rod and that it pivots in a pivot rod cup that Mallas describes as a socket 68. The push rod of Mallas cannot be considered a pivot rod of the claims for several reasons. As known in the art, the function of a push rod is to push the rocker arm such that rocker arm operates on the valve bridge, which in turn operates on the valves. When one of skill in the art is asked to point out a push rod in an engine, such a person would not

point to an item disposed between a rocker arm and a valve bridge. A push rod pushes on the rocker arm, whereas the rocker arm pushes on the pivot rod. A push rod operates on a different part of the rocker arm than a pivot rod. Mallas does not teach or suggest putting his push rod between a rocker arm and valve bridge.

Therefore, Mallas fails to teach *a pivot rod comprising a pivot rod head, wherein at least a part of the pivot rod head pivots within the pivot rod cup, and comprising a pivot rod body, wherein at least a part of the pivot rod body pivots in the pivot rod chamber*, as set forth in independent claim 1, and Mallas also fails to teach *a pivot rod comprising a pivot rod head, wherein at least a part of the pivot rod head is pivotable within a pivot rod cup of a rocker arm, and comprising a pivot rod body, wherein at least a part of the pivot rod body pivots in the pivot rod chamber*, as set forth in independent claim 14.

In summary, Mallas fails to teach at least a valve bridge having a pivot rod chamber and a pivot rod as set forth in independent claims 1 and 14.

The Mallas reference fails to teach at least two elements of independent claims 1 and 14, thus a 35 U.S.C. §102(b) rejection over claims 1 and 14 is not sustainable in view of the Mallas reference. Hence, the applicant respectfully submits that claims 1 and 14 may be passed to allowance.

GROUP II CLAIMS

Group I consists of claims 7 and 19, which stand rejected under 35 U.S.C. §102(b) in view of Mallas. In addition to failing to teach the subject matter of independent claims 1 and 14 on which claims 7 and 19 depend, respectively, Mallas makes no teaching or suggestion that a pivot rod and pivot rod chamber cooperate to form a contact line. FIG. 7 of Mallas appears to show a complete mating of shapes between the end of the push rod and the pocket in the cam follower in which the push rod end is inserted, thus Mallas does not teach or suggest forming a *contact line*, as described above or as set forth in claims 7 and 19. Thus, 35 U.S.C. §102(b) in view of Malls is not supportable over claims 7 and 19, which are thus separately patentable.

GROUP III CLAIMS

Group I consists of claims 3, 5, 6, 15, 17 and 18, which stand rejected under 35 U.S.C. §103(a) given Mallas in view of Perez.

Perez describes a rocker arm assembly that operates with a rocker ball that is secured to the rocker arm, and a socket operating with the rocker ball such that the socket slides along a valve surface. Perez does *not* describe *a pivot rod comprising a pivot rod head, wherein at least a part of the pivot rod head pivots within the pivot rod cup, and comprising a pivot rod body, wherein at least a part of the pivot rod body pivots in the pivot rod chamber*, as described in claim 1. For similar reasons, Perez does *not* describe *a pivot rod comprising a pivot rod head, wherein at least a part of the pivot rod head is pivotable within a pivot rod cup of a rocker arm, and comprising a pivot rod body, wherein at least a part of the pivot rod body pivots in the pivot rod chamber*, as described in claim 14. The Examiner agreed with these statements because he removed the 35 U.S.C. §102(b) rejection in view of Perez.

Thus, the claims of the present invention are not taught or suggested by Mallas and/or Perez. Combining these references fails to teach or yield the invention as claimed. The combination of these references fails to teach or suggest all the elements of the claims. Further, one of skill in the art would not be motivated to make such a combination. Therefore, the present invention is not obvious in light of any combination of Mallas and/or Perez.

Furthermore, claims 3, 5, 6, 15, 17 and 18 are each dependent upon an independent claim that is shown to be allowable. For all these reasons, the dependent claims are themselves allowable.

SUMMARY OF ARGUMENT

As shown above, Mallas does not support a 35 U.S.C. §102(b) rejection, and the combination of Mallas and/or Perez fails to teach or suggest all the elements and combinations of the claims of the present invention, thus it would not be obvious to produce the invention as claimed from these references, and a 35 U.S.C. §103(a) rejection is not supported by the Mallas and/or Perez references. Withdrawal of the rejections under 35 U.S.C. §102(b) and 35 U.S.C. §103(a) and a Notice of Allowance of claims 1-9 and 11-19 are hereby respectfully requested.

IX. APPENDIX

Claims 1-3, 5-7, 14, 15, and 17-19 involved in the appeal are reproduced below.

1. A valve actuation linkage mechanism for use in an internal combustion engine comprising:

a rocker arm having a pivot rod cup;

a valve bridge having a pivot rod chamber; and

a pivot rod comprising a pivot rod head, wherein at least a part of the pivot rod head pivots within the pivot rod cup, and comprising a pivot rod body, wherein at least a part of the pivot rod body pivots in the pivot rod chamber.

2. The valve actuation linkage mechanism of Claim 1, further comprising a pivot rod retainer.

3. The valve actuation linkage mechanism of Claim 2, wherein the pivot rod retainer comprises:

a pivot rod orifice having at least one pivot rod prong; and

at least one securing orifice.

5. The valve actuation linkage mechanism of Claim 1, wherein the pivot rod chamber further comprises a lubricant dimple.

6. The valve actuation linkage mechanism of Claim 2, wherein the pivot rod comprises:

a pivot rod head;

a pivot rod neck;

a pivot rod body; and

a pivot rod bottom.

7. The valve actuation linkage mechanism of Claim 1, wherein the pivot rod and pivot rod chamber cooperate to form a contact line.

14. A valve actuation linkage mechanism for use in an internal combustion engine comprising:

a pivot rod retainer;

a valve bridge having a pivot rod chamber; and

a pivot rod comprising a pivot rod head, wherein at least a part of the pivot rod head is pivotable within a pivot rod cup of a rocker arm, and comprising a pivot rod body, wherein at least a part of the pivot rod body pivots in the pivot rod chamber.

15. The valve actuation linkage mechanism of Claim 14, wherein the pivot rod retainer comprises:

a pivot rod orifice having at least one pivot rod prong; and

at least one securing orifice.

17. The valve actuation linkage mechanism of Claim 14, wherein the pivot rod chamber further comprises a lubricant dimple.

18. The valve actuation linkage mechanism of Claim 14, wherein the pivot rod comprises:

a pivot rod head;

a pivot rod neck;

a pivot rod body; and

a pivot rod bottom.

19. The valve actuation linkage mechanism of Claim 14, wherein the pivot rod and pivot rod chamber cooperate to form a contact line.

Respectfully submitted,

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